

REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 27-29, 31-45 and 53-65 are pending in the present application, Claims 27 and 53 having been amended, and Claim 30 having been canceled without prejudice or disclaimer, and Claim 65 having been added. Support for the amendments to the claims is believed to be self-evident from the originally filed disclosure.¹ Applicants respectfully submit that no new matter is added.

In the outstanding Office Action, Claims 27, 28, 30, 34-36, and 41 were rejected under 35 U.S.C. §103(a) as unpatentable over Neilson et al. (U.S. Patent No. 6,054,369, hereinafter Neilson); Claims 29, 42, 43, 53, and 54 were rejected under 35 U.S.C. §103(a) as unpatentable over Neilson in view of Bredthauer (U.S. Patent No. 4,742,017); Claims 31-33 were rejected under 35 U.S.C. §103(a) as unpatentable over Neilson in view of Kish, Jr. et al. (U.S. Patent No. 5,783,477, hereinafter Kish) and Abe et al. (U.S. Patent Publication No. 2002/0157790, hereinafter Abe); Claims 37, 38, and 44 were rejected under 35 U.S.C. §103(a) as unpatentable over Neilson in view of Kub et al. (U.S. Patent No. 6,274,892, hereinafter Kub); Claims 39 and 40 were rejected under 35 U.S.C. §103(a) as unpatentable over Neilson in view Yu et al. (U.S. Patent No. 6,410,371, hereinafter Yu); and Claims 55-57 were rejected under 35 U.S.C. §103(a) as unpatentable over Neilson in view of Bredthauer, and further in view of Abe.

Applicants respectfully submit that amended Claim 27 patentably distinguishes over Neilson. Amended Claim 27 recites, *inter alia*,

implanting a metallic species in at least the first wafer at a dose above 10^{16} species/cm²,

¹ See, for example, previous claim 30, page 2, lines 24-25, and examples 1-6 beginning at page 12 of the specification.

assembling the first wafer and the second wafer by molecular bonding, and

after the molecular bonding, forming a metallic ohmic contact including alloys formed between the implanted metallic species and the semiconducting materials of the first wafer and the second wafer, said metallic ohmic contact being formed at an assembly interface between the first wafer and the second wafer,

wherein the forming includes causing the implanted metallic species to diffuse towards the interface between the first wafer with the second wafer and beyond the interface.

Neilson does not disclose or suggest every element of amended Claim 27.

The Office Action takes the position that Neilson discloses formation of an alloy (see OA, page 3, “Thus the metallic species react with the silicon wafer...”). There is no reaction in Neilson for forming an alloy between metallic species and a semiconducting material. In Neilson, the implanted elements diffuse away from the interface (see col.5, l.8-12) and are distributed in buffer layer 24 (see col.4, l.45-49) to form recombination centers, not an alloy. In Sze (relied upon as evidence by the OA), there is a deposition of a metal layer and then a diffusion of metallic species into the bulk material, but no formation of an alloy with a semiconductor material, and no diffusion beyond an interface. Sze does not disclose that species are going to diffuse beyond an interface because there is no interface between two substrates in Sze (see figure 41, page 190 of Sze).

In Neilson, the concentration of 10^{14} cm^{-3} to 10^{19} cm^{-3} (col.4, l.51 of Neilson) is far too low to make an ohmic contact (see Sze, page 187, first sentence of §3.6: “An ohmic contact is defined as a metal-semiconductor contact that has a negligible junction resistance relative to the total resistance of the semiconductor device” [emphasis added]). With the concentrations given in Neilson, recombination centers are made, and there is no formation of an alloy and no formation of any ohmic contact. The Office Action does not establish that a

metal semiconductor alloy would result in a negligible junction resistance to form an ohmic contact.

Using software called SRIM, the doses of implanted species of Neilson have been calculated based on the concentration indicated in col.4, 1.51 of Neilson:

- For a concentration of $10^{19}/\text{cm}^3$ a dose of $1.3 \times 10^{13}/\text{cm}^2$ at 10 keV and $2.10^{14}/\text{cm}^2$ at 250 keV are obtained.
- For a concentration of $10^{14}/\text{cm}^3$ a dose of $2.10^{14}/\text{cm}^2$ at 10 keV and $2.10^9/\text{cm}^2$ at 250 keV are obtained.

The doses employed in Neilson are therefore much lower than the claimed at least $10^{16}/\text{cm}^2$.

In view of the above-noted distinctions, Applicants respectfully submit that Claim 27 (and any claims dependent thereon) patentably distinguish over Neilson.

With respect to the rejection of Claim 53 as unpatentable over Neilson and Bredthauer, Claim 53 recites elements analogous to those of Claim 27. Thus, Claim 53 (and any claims dependent thereon) patentably distinguish over Neilson. Moreover, Bredthauer does not cure the deficiencies in Neilson. Bredthauer does not describe a reaction for forming an alloy between metallic species and a semiconducting material, and does not describe diffusion beyond an interface.

Moreover, Yu, and Abe have been considered but do not cure the above-noted deficiencies in Kub.

Furthermore, new Claim 65 patentably distinguishes over the cited references for at least the reasons stated for Claim 27. Furthermore, new Claim 65 is directed toward a silicide alloy. Nielson does not disclose forming a silicide alloy.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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